DEVICE AND METHOD FOR REPRESENTING A SURFACE

The present invention relates to a device and a method for representing any type of desired surface, in particular a surface that integrates both switching/controlling elements in a graphical representation and the circuit conditions within any desired process, whereby the input elements are capable of reading out changing functions and the latter are clearly associated with the input element in a graphical, pictorial form. Furthermore, the invention relates to the controlling of complex processes that are to be controlled and monitored on a representation surface sized as small as possible.

Such surfaces for controlling and regulating processes of any type are well known in the prior art and are currently controlled and regulated via keys, rotary controls or shift registers, the function of which is clearly fixed by means of association with defined components or corresponding legends. Changing functions of the control elements are currently indicated to the user by means of simple light displays or by illuminated alpha-

numerical displays that are controlled by a microprocessor, or displayed on video screens that are arranged around the control elements. The drawback of an alpha-numerical display lies in the fact that its inherent display capability is limited to the representation of characters according to the American Standard Code for Information Interchange (ASCII code); however, its advantage lies in the relatively low manufacturing cost of such a type of display. Liquid-crystal display screens, which are frequently used as well, offer distinctly greater graphical display possibilities than alpha-numerical displays and combine such displays with representations in different colors. The drawback of liquid-crystal display screens, however, lies in their relatively high manufacturing cost as well as in their programming of the desired representations of functions, which requires substantial expenditure, so that their use in a special customer-specific form will be profitable only if such LCD's are produced in large series. Furthermore, the use of a plurality of display screens in one device is very cost-intensive.

Another possibility for representing complex processes at favorable cost, and for controlling them in a clear

form, which can be realized in small series as well, consists in the application of commercially available computer display screens that are currently provided with input elements arranged around the display screen, or which are coated with a surface that is sensitive to touch. Such a variation for controlling processes offers the benefit that the manufacturer is able to make use of commercially available primary products, and to adapt the latter in a simple manner to his own control processes by means of an operating system that is commercially available as well. For such a purpose, the complete spectrum of graphics software is available to the manufacturer, so that the necessity of having to produce at substantial expenditure his own display elements can be dispensed with. Use is currently made of said possibility is all areas of control technology. Examples of such application include automatic bank tellers, weighing systems, sound studio equipment and information systems.

However, the reason for which a display screen that is sensitive to touch constitutes a disadvantage lies in the fact that a switching process is triggered without any noticeable acknowledge message, so that it is easily possible to trigger a process inadvertently. A further

drawback lies in the fact that a controlling and regulating process that actually could be usefully controlled via a rotary control element, is not supported by commercially available display screens that are sensitive to touch. Furthermore, a display screen that is sensitive to touch is capable of controlling only one function at a time.

Said drawbacks are compensated by display screens. Such display screens are provided with keys or rotary controls that are arranged around the display screen. However, arranging such control elements leaves large parts of the display screen mainly located in the center of the display screen unused for the actual control function. Likewise, the radial representation of a condition around a control element is not possible in this form if the control element is located on the edge of the display screen.

Therefore, the problem of the present invention is to provide both a device and a method that are capable of representing a switching/controlling surface with commercially available means in a simple manner and at favorable cost on a surface of representation that is sized as small as possible.

Said problem is solved with the characterizing features of the independent main claim.

The method for representing a surface as defined by the invention is characterized in that a display screen is partly or wholly covered by means of an add-on component, whereby such an add-on component receives a switching/controlling element that, when actuated, triggers a function, and is capable of effecting a display on the display screen.

The device as defined by the invention produced according to said method comprises a display screen, to which an add-on component is mechanically connected upstream, such an add-on component comprising at least one electrical switching/controlling element.

The device as defined by the invention for controlling and regulating processes is in particular characterized in that a display screen is provided with a transparent or opaque surface that supports keys, rotary control elements or linear path selectors in any desired location distributed over the display screen, whereby the given state of such controls is graphically displayed in uni- or

multicolor representations by means of the display screen located around the respective control element and beneath the respective control element, or in one or a number of sites located next to the respective control element, in a manner controlled by software in any desired way.

It is basically possible to employ in an advantageous manner any high-resolution display screen, whereby cathode-ray picture tubes, LCD-displays or LED displays are preferably employed.

The add-on component connected upstream of the display screen represents a flat cover, as a rule, which is partly or wholly transparent or opaque depending on how the surface is to be designed.

The switching/controlling elements may be advantageously arranged in the add-on component, whereby the switching/controlling elements are electrically connected to other electric/electronic components such as, for example a microprocessor by means of a printed circuit. The switching/controlling elements are micro-keys, rotary controls or linear path selectors, as a rule. The electric/electronic components must not necessarily be

secured on the add-on component, but can be arranged outside of the surface just as well.

It was found to be extremely advantageous to the present invention that graphics generated with commercially available software can be generated on the display screen in radial relation to the corresponding switching/controlling elements, such graphics displaying the given switching state when the switching/controlling elements are actuated. The graphics do not have to be uni-colored in this conjunction but may just as well be designed in terms of color according to the preferences of the user.

It is advantageous also, furthermore, if a moving television image is blended into the surface or the display screen instead of the graphics.

The material advantageously may consist of plastic, metal, or a combination of the two materials, whereby the worked-in breakthroughs serve as windows of the display screen or for receiving the switching/controlling elements.

It is, of curse, advantageous if the controls of the switching/controlling elements are designed in an ergonomically useful manner.

Other features essential to the invention are specified in the dependent claims.

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The invention is explained in greater detail in the following with the help of drawings, in which

FIG. 1 is the front view of an add-on component (2) as defined by the invention, which has different switching/controlling elements (3, 4 and 5).

FIG. 2 is the side view of the surface (1) as defined by the invention, comprising the add-on component (2), which is mechanically connected upstream, and the display screen (6) connected downstream;

FIG. 3 is the front view of an exemplified embodiment of a complete surface (1) as defined by the invention.

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FIG. 1 shows the front view of an add-on component (2) as defined by the invention. The add-on component 2 is

generally a flat cover that is mechanically associated upstream of a suitable display screen 6. The switching/controlling elements 3, 4 and 5 may be arranged in any desired site on the entire surface, which is generally dependent upon which kind of division is deemed useful. In the present exemplified embodiment, the rotary controls are arranged in the top row. The sliding controls 4 are located in the center row, and the pushbuttons 5, which actuate a switch or the like, are arranged in the bottom row. In the radial direction, the recesses 8, 9 and 10 are arranged around the switching/controlling elements 3, 4 and 5, such recesses permitting an unobstructed view of the display screen 6 located underneath. The windows 10 could be omitted if a transparent, light-permeable top attachment 2 were used.

FIG. 2 shows a schematized side view of the entire surface 1. The display screen 6, which may be a high-resolution cathode-ray tube or an LCD-display, is provided with an add-on component 2 that is masking the display screen 6. The switching/controlling elements 3, 4 and 5 are arranged in this conjunction within the add-on component (mask), which, however, is not necessarily required. In other exemplified embodiments, which are not shown here,

the switching/controlling elements 3, 4 and 5 are mounted on the add-on component 2.

An example of a complete surface 1 is schematically shown in FIG. 3. The round buttons located in the four horizontal rows symbolize the switching/controlling elements 3, 4 and 5. The graphics 7 can be seen radially in relation to the switching/controlling elements, such graphics having been generated with the help of commercially available software, so that any desired representation can be selected. Another exemplified embodiment of the radially arranged graphics 7 can be seen in the bottom row.

The invention thus permits the use of commercially available operating systems such as, for example Microsoft Windows or Apple DOS, in order to represent all control functions in the form of high-resolution graphics in color on a commercially available cathode-ray display screen or liquid-crystal display screen, whereby the manufacturer is able to make use of the advantage of employing ergonomically useful control elements that he is familiar with. An add-on component of the type described above for forming a surface as defined by the invention can be

prefabricated by simple milling and drilling operations, so that the manufacture of such a mask is economical both for individual units and small manufacturing series as well.

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